In the evening over a thousand members were entertained by the local committee in the Theatre Royal, and witnessed Mr. Wilson Barrett's company in the new play *Pharaoh*.

The concluding day, Thursday, was devoted to whole day excursions to "The Dukeries" (Sherwood Forest, Welbeck, Clumber, Thoresby, &c.), the Midland Railway Works at Derby, Chatsworth and Haddon, Charnwood Forest, Dovedale, Castleton, Matlock and Miller's Dale. The weather was all that could be desired, and the complete organisation led to everything passing off punctually and without a hitch.

The generally expressed opinion of the departing guests was that no meeting was comparable to the present one for enjoyment except that at Montreal. The workers seemed to be generally of opinion that in no direction had the gathering been so useful as in the discussions initiated in several of the sections, to which reference has been made in recent numbers of NATURE. Undoubtedly one of the greatest advantages derived by the annual gathering is the meeting of "researchers" from all parts for the interchange of ideas, and the making and renewal of acquaintance one with another. The impression apparently made on all who have been concerned in the meeting is that the British Association is by no means in a declining condition. It is instinct with life, and those of the inhabitants of Nottingham who have felt the vivifying effect of being brought into contact with many of the scientific pioneers of our time, will wish that the Association, which has stimulated their scientific ardour by its presence, may live to benefit other important centres for many years to come. FRANK CLOWES.

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## NOTES.

IT is announced that the bust of the late Prof. John Marshall, which has been subscribed for as a memorial to him, will be handed over to the Council of University College on the occasion of the introductory lecture, by Mr. Bilton Pollard, at the opening of the session on Monday, October 2.

M. JANSSEN, writing to M. Bischoffsheim from the summit of Mount Blanc, on September 12, says that the Observatory has been fixed in its place, and all that now remains is to fit up the interior. It is hoped that observations will be commenced this autumn.

WITH much regret we record the death of Mr. Thomas Hawksley, the well-known civil engineer, on Saturday, September 23. Mr. Hawksley had for some years been at the head of that branch of his profession which deals with gas and water supply. It is said that more than 150 waterworks were constructed under his direction, besides a large number of important gasworks. He was born in 1807, and elected a Fellow of the Royal Society in 1878. In 1871 he was chosen as President of the Institution of Civil Engineers, and held that office for two years. The Institution of Mechanical Engineers elected him President in 1876-7, and he was the first President of the Gas Institute. In addition to these distinctions Mr. Hawksley possessed a number of decorations conferred upon him by various Sovereigns for services to science and to themselves. At the ripe old age of eighty-eight he passed away, leaving behind him a name which will be honoured for many years to come.

THE Right Hon. Lord Thring will, on Tuesday, October 3, distribute the prizes to the successful students of the Medical School of St. Thomas's Hospital. The distribution will take place at three o'clock, in the Governors' Hall.

AT a meeting of the Committee of the Sunday Society, at the Prince's Hall, on Tuesday, the date of Museum Sunday this year was fixed for November 26, when, as in November last, addresses are to be delivered in support of the Society's object, viz. the opening of museums, art galleries, and libraries on Sundays.

PROF. H. A. NICHOLSON will commence the Swiney Lectures on Geology on Monday, October 2, at the South Kensington Museum. His subject is "The Bearings of Geology on the Distribution of Animals and Plants."

THE Gilchrist trustees have granted the delivery of a course of science lectures at the Great Assembly Hall, Mile End Road, on alternate Thursdays, beginning this evening, when Prof. V. B. Lewes will discourse on "Our Atmosphere and its Relation to Life." The other lecturers will be Sir Robert Ball, Prof. Fleming, Rev. Dr. Dallinger, Dr. R. D. Roberts, and Dr. Andrew Wilson. The course will be in connection with the Bethnal Green Free Library.

A COURSE of twelve educational lectures on the principles of Commercial Geography applied to the British Empire will be delivered by Dr. H. R. Mill, at the London Institution, on Tuesday evenings, commencing on October 3. At the opening lecture, which is free, the plan of the course will be explained. Mr. H. J. Mackinder will follow Dr. Mill with a course on the relations between History and Geography.

THE following lectures will be delivered at the Royal Victoria Hall, Waterloo Bridge Road, during October:—"The Life and Work of Sir Richard Owen," by A. Smith Woodward; "A Total Eclipse of the Sun," by Prof. Thorpe; "Electrical Fishes," by Dr. W. D. Halliburton; and "The Compass in Iron Ships," by Prof. Reinold.

THE Dublin Water Committee has recently been carrying out experiments in rain-making. On the 20th inst. three dozen distress signals and one dozen rockets were fired into the air, and ten pounds of tonite were exploded on the ground. A copious fall of rain occurred shortly afterwards, especially on that part of the watershed between the Djouce and the Sugar Loaf Mountains. Whether the precipitation was directly caused by the fireworks is, however, a matter of opinion.

THE weather in these islands has recently undergone considerable change, owing principally to a deep depression which for several days lay between the Shetlands and Norway, causing northerly gales in Scotland, and snow in the northern parts of the kingdom. Frosts have occurred at night over Scotland and the central parts of England and Ireland, while in many places the daily maxima have fallen below 50°. Rainfall exceeding an inch in the twenty-four hours has occurred at several stations in Scotland, but in the midland and southern parts of England the weather generally has continued very dry. From the commencement of the year there is a deficiency in the amount of rain in all districts, amounting to nearly seven inches in the midland counties and south-west of England, and to more than nine inches in the west of Scotland.

THE Rev. S. Chevalier, S.J., Director of the Zi-Ka-Wei Observatory, has recently read a paper before the Shanghai Meteorological Society on the *Bokhara* typhoon which occurred in October, 1892. The typhoon originated on the 7th of October to the east of Luzon, and on the 10th passed very near to the south Cape of Formosa and, whilst crossing that island, wrecked in one night the Norwegian steamer *Normand* and the Peninsular and Oriental steamship *Bokhara*. Observations have been collected and collated for the whole area which came under the influence of the storm, and diagrams are given for selected stations to show the action of the barometer and the position of the typhoon each day from October 8th to 11th. The author considers that the occurrence of a high barometer cannot be taken as a satisfactory indication of a typhoon, as is sometimes asserted, and he gives considerable attention to testing the relation which existed between the occurrence of a high barometer and the typhoon which followed. The first intelligence of the typhoon reached Shanghai on October 8, when a telegram was received from Manila, dated October 7, reporting it to the south-east of Luzon. Mr. Chevalier is of opinion that the typhoon was situated to the north-east, and not to the south-east of Luzon, and he adds that the *Bokhara* left Shanghai with inaccurate information. The storm apparently had its centre about sixty-five miles to the north-east of Appari at 2 p.m. on the 9th, and it must have travelled directly towards the south Cape of Formosa, being about 130 miles distant at 9 p.m. At that time the *Bokhara* was outside the Channel, and had not yet entered into the gale. From the quick fall of the barometer and the veering of the wind from north-east to south-west in a few hours, it is evident both that the centre had passed very near the Cape, and that it had recurved towards the north and north-east, instead of continuing to the north-westward. The barometer on board the *Bokhara* when at its lowest was 29·15 inches, where it remained for several hours. On the evening of the 10th the vessel was quite unmanageable owing to the heavy wind and sea, and was cast on the reef before midnight. The paper contains much valuable data relating to the violent storms which occur from time to time in the China seas.

THE detection of particular pathogenic bacteria in water in the presence of numerous harmless water forms, involves the use of special methods requiring much care and skill in their application. Koch (*Zeitschrift für Hygiene*, vol. xiv. 1893) recently recommended for the isolation of the cholera organism in water the addition of one per cent. of peptone and one per cent. of common salt to 200 c.c. of the water under examination. The latter ingredient is added on account of Dunham's discovery that the cholera bacilli multiply very rapidly when more salt than usual is added to the culture material. The treated water is then incubated at 37° C. for periods of ten, fifteen, and twenty hours, and agar-plates poured at these several intervals, whilst a careful microscopic examination is made of the surface of the liquid. Any colonies resembling those of the cholera organism are isolated from the agar-plates, and are further tested for the indol reaction, as well as for the pathogenic action on guinea-pigs. Koch states that by means of this method he was able to identify the cholera bacillus in a number of waters submitted to him during the recent cholera epidemic in Germany. Quite recently another modification has been published by Arens, "Ueber den Nachweis Weniger Cholerakeime in gröszeren Mengen Trinkwassers." (*Münchener med. Wochenschrift*, 1893, No. 10.) The suspected water is first rendered distinctly alkaline by the addition of 1–1·6 c.c. of a ten per cent. solution of caustic potash to 200 c.c. of the water, so that the latter contains ·05–·08 per cent. of KOH. This alkalised water then receives pancreas bouillon in the proportion of one to nine parts of the water. This bouillon is composed of broth obtained from the pancreas to which Witte's peptone is added, and the whole neutralised with carbonate of soda until a highly diluted portion yields a faint red colour with rosolic acid. The treated samples of water are then incubated and examined as described above. Arens claims that by means of this method cholera bacilli can be detected when present in such small numbers as 2 in 5 c.c. of water.

TWO official maps of the geology of parts of Germany have been recently published; one of them, "Geognostische Uebersichtskarte des Königreichs Württemberg," has a scale $\frac{1}{600000}$. The strata are delineated with great minuteness, the subdivisions shown by colour and signs being as follows: 8 Quaternary, 10 Tertiary, 4 Cretaceous, 11 Jurassic, 18 Triassic, 4 Permian, 1 Carboniferous, 1 Devonian (?), 1 Archæan, 6 Igneous. The other map, "Geologische Uebersichtskarte von Elsass-Lothringen," by E. W. Benecke, has a scale $\frac{1}{500000}$. Although on a slightly larger scale, this map shows fewer subdivisions of the sedimentary series than does that of Württemberg; the crystalline rocks of the Vosges, &c., with their associated serpentines and limestones, are, however, carefully drawn. The low price at which these maps are sold is noteworthy—Elsass-Lothringen, 1 mark; Württemberg, 2 marks.

PROFESSOR CHARLES V. RILEY has reprinted, from the Third Annual Report of the Missouri Botanical Garden, the results of his observations, which have now extended over a period of twenty years, on the Pollination of *Yucca*. Every known species of *Yucca* is absolutely dependent, for its fertilisation, on the visits of a single species of insect, in all cases a species of *Pronuba*, a genus of small white moths belonging to the Tineina. The pollen cannot reach the stigmatic tube without artificial aid. The species which has been chiefly observed is *Yucca filamentosa*, which is pollinated by *Pronuba yuccasella*. The process is described in detail by which the female moth pierces the ovary, and deposits the egg in close proximity to an ovule. As soon as the ovipositor is withdrawn the moth runs up to the top of the pistil and thrusts the pollen, which she has gathered from other flowers of the species, into the stigmatic opening, and cross-fertilisation is secured. The larva is developed within the ovary, but the number of ovules destroyed in an ovary is never large, and does not practically affect its fertility. Every other species of *Yucca* has its own special fertilising species of *Pronuba*. *Y. filamentosa* is also abundantly visited by another moth, very similar in appearance to the *Pronuba*, the "bogus *yucca* moth," *Prodoxus decipieus*, which is apparently perfectly useless, and is not dependent on the fertilisation of the ovules for its subsistence. The paper is illustrated by ten plates, and concludes with a monograph of the three known species of *Pronuba* and the ten known species of *Prodoxus*, all named by Prof. Riley.

THE decomposition of any form of energy into two factors, one of which is of a constant magnitude, introduces certain simplifications into the theorems of thermodynamics and chemical physics which appear to merit some attention. Herr W. Meyerhoffer, in the *Comptes Rendus*, points out that the constant factor in the case of heat is not the entropy, as maintained by M. Le Chatelier, but the absolute specific heat, which has the dimensions of an energy divided by degrees of temperature. Entropy, on the other hand, is an energy divided by a number representing the number of degrees possessed by the heat at the time of its passage, and which Herr Meyerhoffer proposes to call the number of the isothermal. The confusion between entropy and absolute specific heat arises from the fact that the dimensions of temperature are at present unknown. Herr Meyerhoffer proposes to call the two factors of energy capacity and potential respectively. Then every transfer of heat will involve a change of two potentials, and the criterion of a reversible process will be the inequality of the two potentials. All the cycles invented since Carnot have always had the same function of transforming the variation of one potential into that of another of different nature. By means of this division of energy, most of the known stœchiometric laws can be reduced to one, thus:—The smallest particles of matter have, in a comparable state, the same capacity of energy. By going through the various forms of energy, Regnault's law concerning the specific heats of gases, and the laws of Dulong and Petit, Faraday, Eötvös, and Dalton may be severally obtained.

MR. JOHN DANIEL has sent us an advance-proof of a paper on "Polarization, using a thin Metal Partition in a Voltameter." The investigation had its starting-point in an observation of Dr. L. Arons', who noticed that ordinary gold leaf, used as a partition in an $H_2SO_4$ voltameter, allowed a current of ·2 or ·3 ampere to pass without any visible development of gas upon the metal, which was pasted over a hole 1½ c.m. in diameter, bored in a glass plate. The glass plate slid in grooves in a wooden frame, which was placed in the middle of the glass-voltameter. When platinium-foil (0·1 mm. thick) was substituted for the gold-leaf, there was a profuse escape of gas from the metal partition. Mr. Daniel has made similar experiments with partitions of gold, silver, aluminium and platinum of various thicknesses, and with various electrolytes, and has obtained for the different substances, values of the "critical thickness" above which polarization at the partition takes place, as well as some other interesting facts as to "critical current density," &c. He finds, for instance, that the "critical thickness" in good-conducting solutions of $H_2SO_4$, $CuSO_4$ and NaCl, is greater than ·00009 mm., but less than ·0004 mm., in the case of gold; while ·00015 mm., and ·002 mm. are the corresponding figures for platinum, with a current density of not more than 0·1 ampere per square c.m. of the metallic partition. Between these "critical limits" the polarisation for a given current increases with the thickness. In $CuSO_4$, all the plates except those below the critical thickness were destroyed by oxidation, and a similar effect was noticed in NaCl, in which gold and silver below the critical thickness were quite unaffected, while above it they could not be used on account of the chemical action.

NOTES from the Marine Biological Station, Plymouth.—Last week's captures include the Ascidian *Ascidia mollis*. The tow-nets continue to yield the regular autumn forms, among which the Liphonophore *Muggiæa atlantica* and the larvæ of the Polychæta *Magelona* and *Terebella* have generally been plentiful. An interesting feature of recent tow-nettings has been the presence of numerous minute free-floating colonies of certain Didemnidæ. Young *Echini* and *Asterinæ* of this season's growth are now plentiful at a depth of five fathoms and in coralline tide-pools respectively. The following animals are breeding:—The Hydroid *Sertularella Gayi*, the Nemertine *Amphiporus dissimulans*, the Archiannelid *Histriobdella Homari*, and the parasitic Cirrhipede *Sacculina*.

THE additions to the Zoological Society's Gardens during the past week include a Leadbeater's Cockatoo (*Cacatua leadbeateri*) from Australia, presented by Miss Mercy Grogan; a Common Quail (*Coturnix communis*) British, presented by Mrs. Mazelin; two Black-pointed Teguexins (*Tupinambis nigro-punctatus*) a Crowned Snake (*Scytale coronatum*), a Tree Boa (*Corallus hortulanus*), a —— Snake (*Leptognathus nebulatus*) from Trinidad, W.I., presented by Messrs. Mole and Urich; two Hamsters (*Cricetus frumentarius*, white var.) European, a Black-headed Caique (*Caica melanocephala*) from Demerara, a Corean Sea Eagle (*Haliætus branickii*) from Corea, a Black-pointed Teguexin (*Tupinambis nigro-punctatus*), a Tree Boa (*Corallus hortulanus*), a Boddært's Snake (*Coluber boddærti*) from Trinidad, W.I., deposited; a Golden Plover (*Charadrius pluvialis*) British, purchased.

## OUR ASTRONOMICAL COLUMN.

NOVA (T) AURIGÆ SPECTRUM.—In the current number of the *Astronomischen Nachrichten* (No. 3189) Mr. W. W. Campbell communicates his observations of the spectrum of Nova Aurigæ since its reappearance in August. At this time the continuous spectrum was very faint, the spectrum consisted of isolated bright lines, and the three brightest lines had the intensities and positions of the characteristic nebular lines, the result being that the spectrum of this new star was announced to be that of a planetary nebula. That this view has not been universally adopted is shown by Vogel's paper on the same star, and he inclines to the opinion that the bright lines are chromospheric, and that the brightest line is not the nebula line. In the present paper Mr. Campbell has made more visual and long exposure photographic observations of nebular spectra, and finds no less than five other lines which are in the spectrum of the new star. The nebulæ he uses here for comparison are: Orion, G.C. 4390, N.G.C. 7027, G.C. 4964, G.C. 4373, and in the photographs of their spectrum he obtains 12, 12, 7, 10, and 5 lines respectively that appear to him to be new. The tabulated list of lines brings out very clearly, that with the exception of the line 451, the identity of which is uncertain in these nebulæ, the Nova lines are matched perfectly in one or more of them, allowing for the fact that they (the Nova lines) were shifted about five-tenth metres (in August and November, 1892) towards the violet. The Nova spectrum, as Mr. Campbell says, "certainly differs no more from the nebular spectra than the nebular spectra differ from each other." As for the lines, 4857, 4336, 4098, and 396 are the well-known hydrogen lines; 5002, 4953, the first and second nebular lines, while all the others correspond well with the nebular lines. The presence of these four hydrogen lines and the chromospheric line 4472, strengthens, as he says, his argument, and he concludes with the words that "if the spectrum is not conceded to be nebular, I must ask what else we should expect in that spectrum if it were nebular?"

THE FIREBALL OF JANUARY 13, 1893.—In the *American Journal of Science* (vol. xlvi. September, 1893), Prof. H. A. Newton contributes a discussion of all the observations that were made of the large fireball that was observed in America in January last. The great interest attached to this fall lay in the fact, as previously mentioned in this column, that Mr. Lewis, of Ansonia, Conn., happened to obtain a very good picture of the trail as it passed in the line of sight of his instrument while he was photographing the comet Holmes. Prof. Newton seems to have taken great pains to have the information as accurate as possible, and has even had some of the observers cross-examined, so to speak, on many particular points. The plate on which the photograph was taken is 4 by 5 inches, and the meteor went nearly centrally across it, the photographed portion being about 19° long. Several stars of the tenth magnitude in the middle, and some of about the eighth, near the margin of the plate, are shown on the negative, so that some fairly good measurements of the position of the track have been procured. The co-ordinates of seven points of the trail have thus been measured, and a very slight curvature of the path is indicated by the results but not clearly proven, the curvature being caused, as suggested by Prof. Newton, by "the atmosphere's resistance of the irregularly shaped body." An enlarged print of the photograph (about 26 inches long) accompanies the paper. The striking feature of it is the irregularities of light on the path, and also its increase in frequency as the end of the plate is reached. This is due, as supposed, to a rotation of the stony mass, "more rapid at the end than at the beginning, and that the unequal amounts of burned material were thrown off according as a well burned or a raw surface was for the instant in front."

## NITRO-METALS, A NEW SERIES OF COMPOUNDS OF METALS WITH NITROGEN PEROXIDE.

A REMARKABLE new series of compounds, formed by the direct union of nitrogen peroxide with certain metals, and of a nature somewhat akin to that of the metallic carbonyls recently discovered and investigated by Mr. Mond and his co-workers, are described by MM. Sabatier and Senderens in the September number of the *Bulletin de la Société Chimique*. It was observed that when vapour of peroxide of nitrogen in a state of tolerable purity was allowed to stream at the ordinary temperature over metallic copper, cobalt, nickel, or iron, these metals being in the finely-divided and pure condition obtained by the recent reduction of their oxides by hydrogen, rapid absorption of the nitrogen peroxide occurred with the formation of definite compounds possessing properties of an